MOTOROLA INC.
Communications
Sector

DIAGNOSTIC METERING PANEL

MODEL TLN2419A

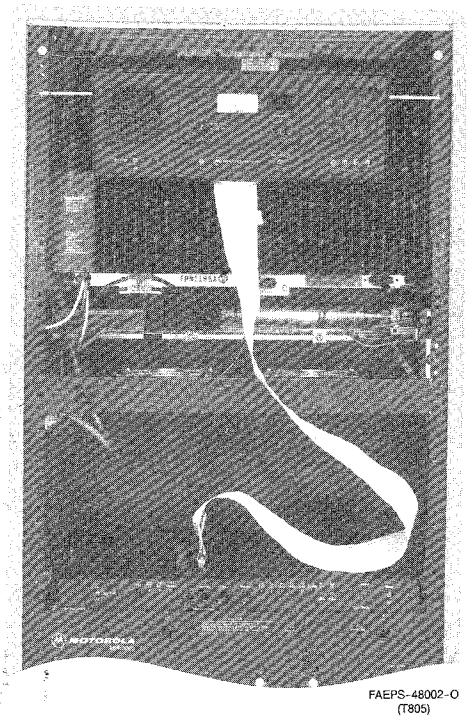

Figure 1. Diagnostic Metering Panel — Front View

1. DESCRIPTION

1.1 GENERAL

The Diagnostic Metering Panel (DMP) is a service option designed specifically for the *MSF 5000* series of base and repeater stations. The DMP includes a 5-watt audio amplifier (and speaker), and a meter used to monitor the station transmitter and receiver circuits. The meter circuit provides five selected metering positions, as well as a 10-volt or a 25-volt full scale dc voltmeter selected position. The DMP also provides a station parameter status display matrix, which permits the service technician to simultaneously monitor the status of up to 64 different station operating parameters (bits), as shown in Table 1.

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Table 1. Station Parameter Status Display Matrix				
ADDRESS	D3	D2	D1	D0
0	SP XMT	SCAN	T ALM DS	S ALM DS
1	RPT PTT	LIN PTT	LOC PTT	INTCOM
2	TX PL DS	TX ACT**	RX2 ACT	RX1 ACT
3	RX PL DS	R1 PL DT	R1 SQ LV	R1 UN SQ**
4	R2 MUTE	R2 PL DT	R2 SQ LV	R2 UN SQ**
5	GD TN DT	AUX DET	RPT KD	RPT USQ**
6	ACC DIS**	EX DA DT	DVP SEL	DVP C/C
7	*	*	*	Baud Rate
8	TX RX C8	AUX C4	AUX C2	AUX C1
9	AUX C8	AUX C4	AUX C2	AUX C1
10	*	*	*	*
11	*	*	*	*
12	RW4 OVG	RW3 SYN	RW2 PA	RW1 BAT
13	RWC 8	RWC 7	RWC 6	RWC 5
14	FWC 4	FWC 3	FWC 2	FWC 1
15	FWC 8	FWC 7	FWC 6	FWC 5

* currently unassigned
** status only bits

These same operating parameters may also be selectively altered using various control switches located on the DMP. Also, two separate 7-segment display units indicate (in hexadecimal notation = $#) the current auxiliary and primary operating station channels ($1 through $F = Channel 1 through 15, and $0 Channel 1).

1.2 DMP 40-CONDUCTOR INTERFACE CABLE

The DMP comes with a separate 40-conductor ribbon interface cable, a separate 8-conductor metering cable with "modular" connectors, two separate voltage probes and a set of housing rods that may be extended and inserted into the mounting rails inside the station cabinet. Refer to Figure 2 for the locations of the connectors used for the CONTROL (J1201), METER (J1202), + voltage probe (J1203), and — voltage probe (J1204). Refer to Figure 3 for a view of the DMP with its front panel removed.

The 40-conductor interface cable connects the station EXPANSION connector J800 (located on the top of the control tray housing) to the DMP CONTROL connector J1201. This cable provides interface lines which connect power, audio and digital signals between the station control board, other control modules within the station, and the DMP. There are four types of signal lines provided, as follows:

- audio line
- dedicated logic line
- multiplexed logic (MUXbus) lines
- power and ground lines

SELECT AUDIO (Pin 32) — Audio Line

The Select Audio signal, originating on the station control module, is the audio input for the local speaker amplifier circuit in the DMP. Any of the following audio signals will be present on the select audio line when it is properly gated by the control circuits in the station: primary receiver audio, secondary receiver audio, transmit audio from the remote wire line, and automatic station I.D. and alarm tone audio. The Select Audio line is connected to the wiper of the VOLUME control on the control tray front panel. Therefore, the dc bias level and ac level on the line vary depending on the VOLUME control setting. The DMP employs an audio power amplifier circuit to provide up to 5 watts of local service audio from the Select Audio signal, through the DMP internal 4-ohm speaker. The audio power amplifier circuit can be disabled with SPEAKER ON/OFF switch S1210, located on the face of the DMP. By connecting an optional microphone (HMN1001) to CONTROL Jack J812 on the front panel of the station control tray, the transmitter can be locally keyed and modulated, or intercom with the remote control console operator can be accomplished.

$\overline{\text{EXPANSION RESET}}$ (Pin 12) — Dedicated Logic Line

The $\overline{\text{EXPANSION RESET}}$ signal is a shared logic line which allows a clean, coordinated start up of the station control module and any other interconnected modules or external equipment (such as the DMP). The $\overline{\text{EXPANSION RESET}}$ signal is active low at power-up, or when station control module switch S801 is put into the TEST position, or when the station control module is reset by its watchdog timer circuit, or when another control module receives a command to reset the station. Also, normal MUXbus operation is suspended while the watchdog timer circuit generated $\overline{\text{RESET}}$ signal is active low. The MUXbus data strobe line $\overline{\text{DS}}$, is held inactive and the MUXbus address and data lines do not follow their normal patterns.

IMPORTANT

While the $\overline{\text{EXPANSION RESET}}$ line is active low, no module except the station control module should write to the MUXbus data lines. Otherwise, the station control module may fail its self diagnostic tests, and remain reset indefinitely.

Multiplexed Logic (MUXbus) Lines

The multiplexed logic (MUXbus) lines consist of the following signals:

- Four Address lines (BA0–BA3) — Pins 13–16
- Four Data lines ($\overline{\text{BD0}}$–$\overline{\text{BD3}}$) — Pins 17–20
- Data strobe ($\overline{\text{DS}}$) — Pin 22

All DMP MUXbus lines are referenced to audio ground (logic ground is not used). The four address and the four

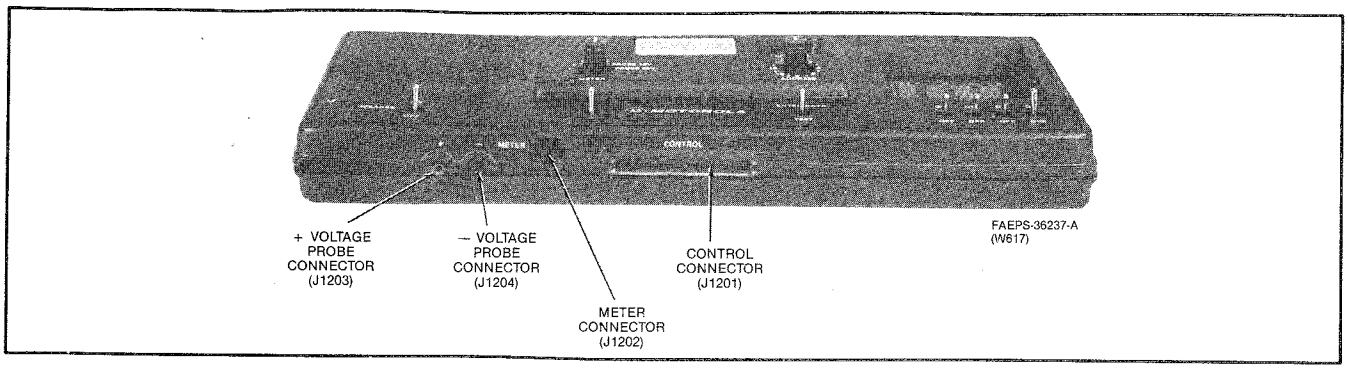


Figure 2. Diagnostic Metering Panel — Edge View

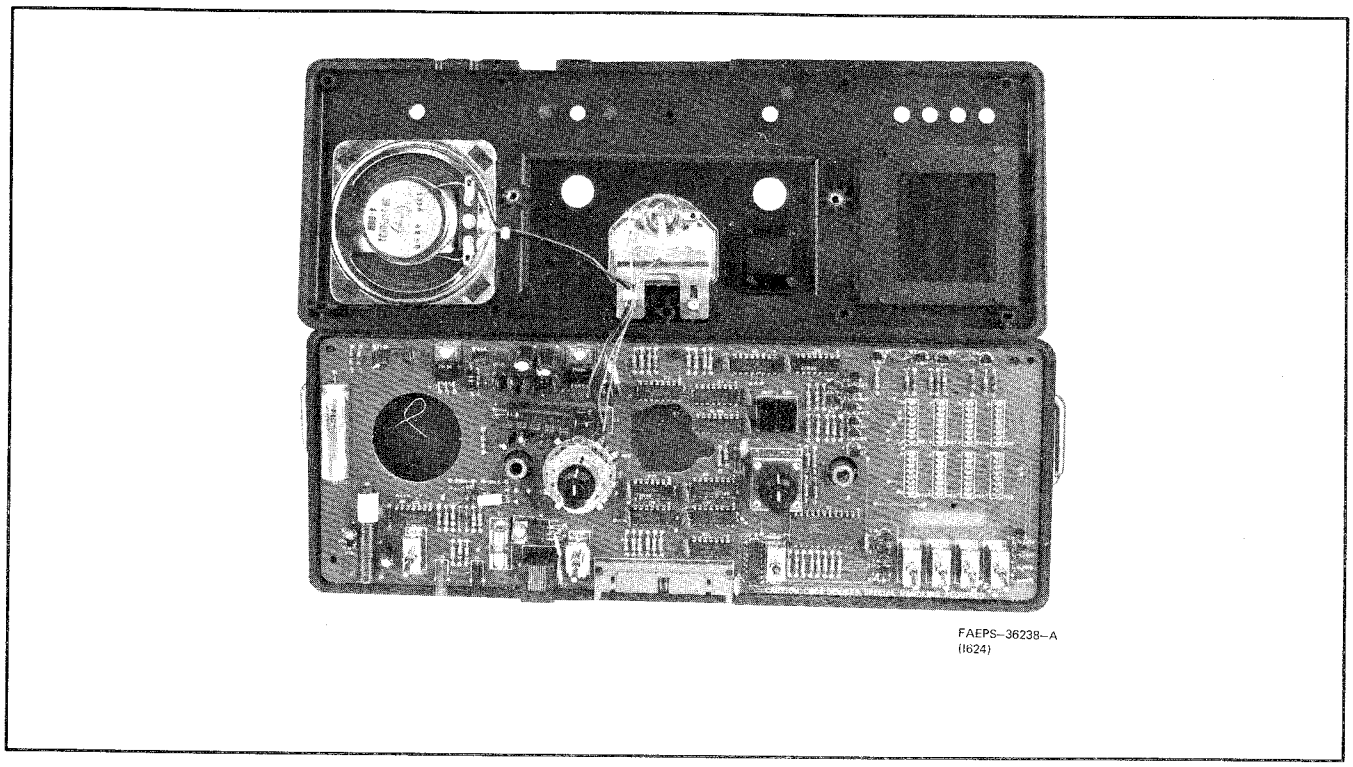


Figure 3. Diagnostic Metering Panel — Internal View

data lines define 16 words of 4-bits each, or 64 total bits as shown in Table 1. These bits form a multi-directional digital communications path. The bus is multiplexed to conserve interconnections (64 connections reduced to 9) and to increase future expansion capability. The data strobe and the four address lines are driven by the station control module. The data lines are inverted and open collector driven in both the station control module and the DMP. This allows the station control module and the DMP to drive the same bit in a nondestructive, wired "OR" fashion.

The MUXbus timing diagram is shown in Figure 4. The address lines are incremented once, approximately every 310 microseconds. The address changes when data strobe is inactive ($\overline{DS}$ = 1). The data must be valid for 1 microsecond before the rising edge of $\overline{DS}$. The data must be valid for 15 microseconds after the rising edge of $\overline{DS}$. At certain times, the MUXbus may be momentarily halted (e.g., during *Channel-Scan*). The halt is, in effect, an extended period of inactive data strobe. The address lines will be driven, but will remain at the address of the MUXbus cycle just prior to the halt. The data lines are in a "don't care" state during a halt and may be random.

Any MUXbus bit, activated by any module other than the station control module, which does not change the state of the station is called a "status only" bit. As an example of a "status only" bit, Transmitter Activity (TX ACT) is activated by the station control module whenever the transmitter has successfully keyed. But, if the DMP activates TX ACT, the transmitter will not key. Thus, TX

ACT is a "status only" MUXbus bit. All "status only" MUXbus bits are signified in Table 1 by a double asterisk (**).

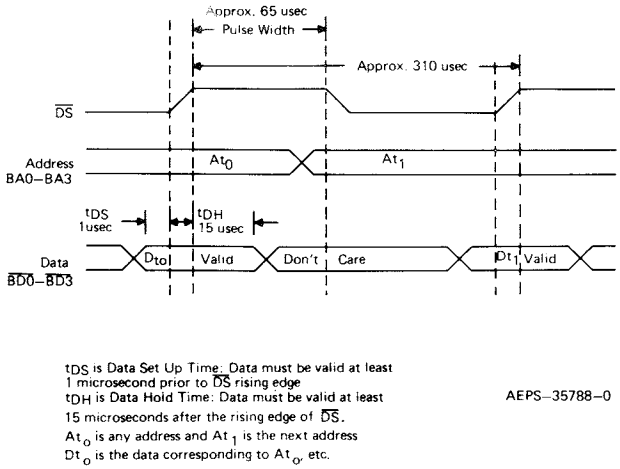


Figure 4. MUXbus Timing Diagram

1.3 DMP 8-CONDUCTOR METERING CABLE

The 8-conductor metering cable connects the DMP METER Jack J1202 to either the station TX Metering or station RX Metering Jack. The TX and RX Metering Jacks (J413 and J210, respectively) are both located on the station RF Tray front panel. The PA Metering Jack (J503) is located on the PA Distribution Board, within the station Power Amplifier Deck. This cable provides interface lines which connect five metering lines and a meter common line to the DMP, as shown in Table 2.

1.4 VOLTAGE PROBES

The two voltage probes plug into two jacks provided on the bottom edge of the DMP: RED = "+" = J1203; BLK = "—" = J1204. Each of the probes is equipped with a reversible blunt or pointed tip.

2. METERING FACILITIES

The DMP provides a measured indication for the signals listed in Table 2 on a 0–50 μA full-scale meter (M1201). The proper indications are the same as those obtained using a Motorola Portable Test Set or TEK-5F Meter Panel, as described in the *MSF5000* Base Station and Repeater Instruction Manual. A specific meter position is selected by using the METER selector switch S1208 on the face of the DMP. When METER selector switch S1208 is in the "10 V" or "25 V" position, the meter monitors the voltage probes and is calibrated to read full-scale voltage (instead of full-scale microamperes).

IMPORTANT

When measuring the power amplifier circuits, via J503, meter REVERSING switch S1209 must be placed in the "—" (or reverse) position. METER REVERSING switch S1209 is normally in the "+" (or forward) position when the DMP is connected to either J413 or J210 (TX or RX Metering, respectively).

3. DIAGNOSTIC FACILITIES

3.1 GENERAL

The right hand portion of the DMP contains the switches and displays required to monitor and manipulate the operating parameters of the station. These functions are made possible by connecting circuits of the DMP to the MUXbus of the station EXPANSION connector (J800).

3.2 CHANNEL DISPLAY

The CHANNEL display consists of two 7-segment LED packages that are used to display the station's current auxiliary operating channel (left-most unit) and its current primary operating channel (right-most unit). The primary operating channel is the channel currently selected for the station transmitter and primary receiver. The auxiliary channel may have several uses, one of which is that it would be the selected channel of the secondary receiver in a 2-receiver station. The operating CHANNEL display changes each time the station changes operating channel, or the operating channel is changed via the channel select switch on the station control tray. The auxiliary CHANNEL display changes only when a change of operating channel occurs.

Table 2. DMP Metering Cable Interface Lines

Line	DMP Meter J1202	TX Metering J413	RX Metering J210	PA Metering J503
1	Meter 1	Forward Voltage	Quadrature Detector	Final Stage 1
2	Meter 2	Not Used	I-F Level	Final Stage 2
3	Meter 3	Control Voltage	Mixer Output	Final Stage 3
4	Meter 4	Not Used	Reference Oscillator	Predriver Stage
5	Meter 5	XMTR Synthesizer Steering Line	RCVR Synthesizer Steering Line	Driver Stage
6	Not Used	GND	GND	Factory Test
7	Meter Common	GND	GND	A+ Meter Reference
8	Not Used	GND	GND	Factory Test

3.3 STATUS DISPLAY

The Station Parameter Status Display Matrix consists of eight 8 element LED packages located behind the recessed screened panel of the DMP. The screening identifies each of 64 MUXbus bits, via a specific mnemonic designation, as shown in Table 1.

The STATUS Display provides a visible indication of the major portion of the main control related activities that are occurring at any time in the station. These include various push-to-talk signals, the state of the squelch circuits, the presence of properly coded squelch signals, the station channel, the station-level alarms and "wild" card functions, as well as specialized activities such as *Channel-Scan* or *DVP* operation.

NOTE

To check to see if all the LEDs in this section of DMP are functional, momentarily switch the ENTER DATA-TEST switch to the TEST position. All 64 LEDs in the STATUS display area should light, and the two-digit CHANNEL display should indicate $FF.

The STATUS Display indicates the active control conditions within the station with a corresponding illuminated LED. The absence of an expected condition can be readily observed as the station is operated, leading to rapid identification of a defective area.

To simulate an active condition in the station using the DMP, select the address or row in the display containing the particular signal with the ADDRESS switch. Next, set one of the data switches D0 through D3 corresponding to the column in the display containing the signal. Momentarily switch the ENTER DATA-TEST switch to the ENTER DATA position and the condition will become active. To clear the condition, return the data switch to the OFF position and flip the switch to the ENTER DATA position once again.

CAUTION

It is recommended that the DMP be disconnected from the control tray (via J800) during station power up. This prevents the station from being initially activated in a possible undesirable function. However, if the station is powered up with the DMP connected, and an undesirable condition does occur, place the four DATA switches to the OFF position, and then toggle the ENTER DATA switch. This will deactivate the four DMP data bits applied to the MUXbus Data Line and remove the undesirable condition

An active condition is also cleared when the ADDRESS switch is moved to a different address, and the ENTER DATA switch is used to activate a MUXbus bit at the new address.

For example, suppose it is desired to verify that the proper alarm tones would be sent by the station in the event of a PA failure. To simulate this alarm condition using the DMP, set the ADDRESS switch to 12 (the row containing the PA alarm signal) and flip the data switch up (for the column containing this signal (D1). Flip the ENTER DATA switch, illuminating the LED in the status display for PA alarm and activating a simulated PA failure alarm. If the station is working properly, two beeps will be heard.

If the D1 switch is turned to the OFF position and the ENTER DATA switch is activated, the PA alarm LED will turn off, and the alarm beeps will cease. Likewise, if the ADDRESS switch is moved to address 1, and the D1 switch is left in the up position, then when the ENTER DATA switch is activated, the PA alarm LED will turn off, the alarm beeps will cease, the LOCal PTT LED will illuminate, and the station will key up.

NOTE

"Status only" bits, when activated by the DMP, will cause their corresponding LED to light, but will not affect a change in station operation. The station causes these LEDs to light when it has successfully accomplished a certain function.

4. MUXBUS BIT DEFINITIONS

4.1 INTRODUCTION

The following paragraphs provide definitions for each of the 64 operating parameters (MUXbus Bits) displayed by the DMP. Each of these bits may have their state changed by the DMP. Each paragraph title gives the MUXbus Bit mnemonic, definition, and row-column address required for access (in the form: #, D#), respectively.

4.2 SP XMIT (SPECIAL TRANSMIT) 0, D3

The SP XMIT bit indicates that the deviation and/or the rf PA power should be either boosted or cut, defined by information in the station control module code plug. The default condition in the station control module code plug, upon activation of this MUXbus bit, is deviation control. This bit will only have an effect during a PTT. The activation of this bit, by itself, will not key the station.

4.3 SCAN (SCAN ENABLE) 0, D2

The SCAN bit forces the station control module to enable the primary receiver as a scanning receiver. The station must be ordered with the *Channel-Scan* option in order for this feature to operate. Only the primary receiver can scan.

4.4 T ALM DS (TOTAL ALARM DISABLE) 0, D1

The T ALM DS bit mutes all alarm tones until this bit is deactivated. This bit will deactivate the station control module alarm bits on the Reverse "Wild Card" bits 1 through 4, but will not affect the other Reverse "Wild Card" bits on the MUXbus. Pulsing T ALM DS for 25 msec or longer will release S ALM DS, if active.

4.5 S ALM DS (SELECTIVE ALARM DISABLE) 0,D0

The S ALM DS bit is meant to support a "nuisance avoidance" alarm feature. The console operator can mute in-progress alarm tones without fear of missing any new alarms. For example, initially all alarm bits (Reverse "Wild Card" bits, addresses 12 & 13) and S ALM DS are inactive. An alarm condition activates an alarm bit, and alarm tones are heard. The wireline control pulses S ALM DS active for 25 msec or longer in response to a remote control console command, and the alarm tones are muted. If the alarm condition were to disappear, the corresponding alarm bit would be deactivated, S ALM DS would be cleared, and no alarm tones would be heard since no alarm bit is active. If, instead, a second alarm bit were activated while the first alarm was active, S ALM DS would be deactivated and alarm tones for both alarms would be heard. The wireline control could re-enable S ALM DS, then alarm tones for both alarms would be muted. S ALM DS does not deactivate the MUXbus alarm bits, but merely mutes the alarm tones.

4.6 RPT PTT (REPEATER PUSH-TO-TALK) 1, D3

The RPT PTT bit keys the transmitter, modulating with RX 1 Audio if no higher-priority PTT is active. If a higher-priority PTT is active, the station control module deactivates RPT PTT. If the repeater PTT time-out timer (TOT) times out, RPT PTT will be deactivated, and the transmitter will dekey. If repeater knock down (RPT KD) goes active while RPT PTT is active, RPT PTT will be deactivated, PL reverse burst or DPL turn off code (RB/TOC) will be encoded if appropriate, and the transmitter will dekey. RPT PTT is active during repeater drop-out delay. RPT PTT is inactive when RB/TOC is encoded. The station control module turns on RPT PTT, if repeater audio activity exists on Receiver 1, and if RPT KD is inactive, and if no higher-priority PTT is active. "Repeater audio activity" is set for each channel by station control module code plug qualifiers. These qualifiers determine what combination of the four MUXbus bits RX P L DS, R1 PL DT, RPT USQ, and AUX DET are ANDed to obtain RPT PTT. Line, Local, and Repeater PTT priorities are set for each channel by station control module code plug qualifiers.

4.7 LIN PTT (LINE PUSH-TO-TALK) 1,D2

The LIN PTT bit keys the transmitter, modulating with TX Audio (inbound wireline) if no higher-priority PTT is active. LIN PTT stays active if a higher-priority PTT is active. LIN PTT is inactive when RB/TOC is encoded, unless the RB/TOC is caused by the Line PT T TOT timing out. If the station is so equipped, LIN PTT switches the antenna switch to its transmit state. Line, Local, and Repeater PTT priorities are set for each channel by station control module code plug qualifiers

4.8 LOC PTT (LOCAL PUSH-TO-TALK) 1, D1

The LOC PTT bit keys the transmitter, modulating with Local Audio if no higher priority PTT is active. LOC PTT says active if a higher priority PTT is active. LOC PTT is inactive when RB/TOC is encoded, unless the RB/T OC is caused by the Local PTT TOT timing out. If the station is so equipped, LO C PTT switches the antenna switch to its transmit state. LOC PTT is active if the PTT switch is depressed on the local microphone plugged into the station control module front panel CONTROL connector J812. Line, Local, and Repeater PTT priorities are set for each channel by station control module code plug qualifiers. The front panel XMIT switch on the station control module will activate TX PL DS and key the station without activating the LOC PTT bit on the MUXbus. This key will be without PL, DPL, or audio (silent carrier). As thusly defined, it is not a true PTT, and can be overridden by any other PTT

4.9 INTCOM (INTERCOM) 1, D0

The INTCOM bit is active if the remote control module INTERCOM switch is actuated. When INTCOM is active, the station control module treats LOC PTT as an Intercom PTT. Local Audio is gated to the wireline (outbound wireline) when a local PTT is generated, but the transmitter is not keyed. When LOC PTT is not active, remote control console audio (inbound wireline) is gated to the 1/2-watt local audio amplifier.

4.10 TX PL DS (TRANSMIT PL/DPL DISABLE) 2, D3

The TX PL DS bit mutes encoded PL or DPL. The Transmit PL Strip wireline option utilizes this bit. If PL or DPL is being encoded when TX PL DS goes active, then RB/TOC will be generated before muting PL or DPL. This bit will also be set active whenever PL/ DPL encoding is disabled, such as during an auto ID transmission, or if the front panel XMIT switch on station control module is activated.

4.11 TX ACT (TRANSMITTER ACTIVITY) 2, D2

The TX ACT is a status only bit, and indicates that the transmit rf channel (outbound) is ready. TX ACT goes active after a keyup, when the transmitter power output has stabilized. In the event of a PA failure on keyup, TX ACT stays inactive (doesn't glitch). TX ACT goes inactive when the station control module dekeys the PA. TX ACT is inactive during RB/TOC.

4.12 RX2 ACT (RECEIVER 2 ACTIVITY) 2, D1

The RX2 ACT bit indicates whether second receiver audio should be used. The second receiver control module

responds to an active RX2 ACT by gating deemphasized, PL-stripped audio from the second receiver to the RX2 audio line. From there, it is mixed with line audio (outbound wireline) by the station control module. RX2 Audio is also mixed with select audio (local speaker) by the station control module.

4.13 RX1 ACT (RECEIVER 1 ACTIVITY) 2, D0

The RX1 ACT bit indicates whether the primary receiver has audio present with the proper qualifiers to unmute receiver audio. This condition is set for each channel by four qualifiers in the station control module code plug. These qualifiers determine what combination of the four MUX-bus bits RX PL DS, R1 PL DT, R1 UN SQ, and AUX DET are ANDed to obtain RX1 ACT. The station control module responds to an active RX1 ACT by opening the RX1 audio gate. This gates RX1 audio to both the line audio (outbound wireline) and select audio (local speaker) lines. RX1 audio is also gated to the station control module repeater audio gate. If the station is transmitting due to a RPT PTT, then the repeater audio gate will be open and RX1 audio will be gated, via the IDC circuit, to the TX modulation audio line.

4.14 RX PL DS (RECEIVE PL/DPL DISABLE) 3, D3

The RX PL DS bit causes the station to revert to carrier squelch only operation for purposes of determining status of RX1 ACT and RX2 ACT. The Monitor and Receiver Squelch On/Off wireline functions utilize RX PL DS. Also, the station control module front panel PL Disable switch activates RX PL DS.

4.15 R1 PL DT (RECEIVER 1 PL/DPL DETECT) 3, D2

The R1 PL DT bit is active when PL or DPL coded squelch is being detected via Receiver 1.

4.16 R1 SQ LV (RECEIVER 1 SQUELCH LEVEL) 3, D1

The R1 SQ LV bit changes the carrier squelch threshold. When R1 SQ LV is active, the primary receiver is operating with "loose" squelch.

4.17 R1 UN SQ (RECEIVER 1 UNSQUELCH) 3, D0

The R1 UN SQ bit is a status only bit, and is active when the Receiver 1 audio carrier squelch circuit on the station control module detects activity. R1 UN SQ is used for audio gating (refer to RX 1 ACT), not for repeater keying (refer to RPT PTT).

4.18 R2 MUTE (RECEIVER 2 MUTE) 4, D3

The R2 MUTE bit causes the second receiver control module to attenuate the audio driving the RX2 audio line, so that Local or RX1 audio can be heard on both the line audio (outbound wireline) and select audio (local speaker) lines. The attenuation is accomplished by means of a potentiometer on the second receiver control module. Therefore, RX2 audio can be fully muted, if desired.

4.19 R2 PL DT (RECEIVER 2 PL/DPL DETECT) 4, D2

The R2 PL DT is active when PL or DPL coded squelch is being detected via Receiver 2.

4.20 R2 SQ LV (RECEIVER 2 SQUELCH LEVEL) 4, D1

The R2 SQ LV bit changes the carrier squelch threshold. When R2 SQ LV is active, the second receiver is operating with "loose" squelch.

4.21 R2 UN SQ (RECEIVER 2 UNSQUELCH) 4, D0

The R2 UN SQ bit is a status only bit, and is active when the Receiver 2 audio carrier squelch circuit on the second receiver control module detects activity. R2 UN SQ is used for audio gating (refer to RX2 ACT). The second receiver can neither key the repeater (activate RPT PTT), nor modulate the transmitter.

4.22 GD TN DT (GUARD TONE DETECT) 5, D3

The GD TN DT bit becomes active whenever high level guard tone is detected from the TX Audio signal (inbound wireline) by the tone remote control module. In stations with an antenna switch, the station control module responds to an active GD TN DT by switching the antenna switch to its transmit state. The TX Audio signal is muted (on the station control module) while GD TN DT is active, in order to prevent remote control tones from being transmitted.

4.23 AUX DET (AUXILIARY DETECT) 5, D2

The AUX DET bit indicates that an optional decoder is detecting. The optional decoder may be connected to either Receiver 1 or Receiver 2 audio. AUX DET can be used to activate TX1 ACT , RX2 ACT, and RPT PTT in a manner similar to the R1 PL DT and R1 UN SQ qualifiers.

4.24 RPT KD (REPEATER KNOCK-DOWN) 5, D1

The RPT KD bit disallows a repeater PTT. Also, this bit forces an existing active RPT PTT inactive.

4.25 RPT USQ (REPEATER UNSQUELCH) 5, D0

The RPT USQ bit is a status only bit, and is active when the Receiver 1 repeater carrier squelch circuit, located on the station control module, detects activity. This bit is used to key the repeater, not to gate audio (refer to RPT PTT).

4.26 ACC DIS (ACCESS DISABLE) 6, D3

The ACC DIS bit is a status only bit, and is active when the Access Disable station control module switch is actuated. ACC DIS active indicates that the following five functions are inhibited: 1) Auto ID; 2) Alarm tones; 3) Time-out timers; 4) Repeater PTT initiated from the primary receiver; and, 5) Wire line commands including Line PTT. When Access Disabled, the station operating channel is selected with the CHANNEL select switch, located on the front panel of the remote control module. The previous station operating channel is "remembered" by the station control module and reinstated when the Access Disable switch is deactivated. If there is no remote control module connected as part of the station (repeater only operation) the DMP channel display will show $0, but the station control module will equate this with Channel 1 operation.

4.27 EX DA DT (EXTERNAL DATA DETECT) 6, D2

The EX DA DT bit, when active, can cause the station control module to mute TX, and/or local, and/or RX1 (Repeater) audios, under code plug programming control. This bit can allow or disallow selected mixing of these audios with TX data audio onto the TX modulation audio line. Which of the three audios is muted depends on which PTT is keying the transmitter. The intent is to optionally prevent audio from mixing with TX Data audio. Whether or not mixing occurs is determined by a qualifier for each channel in the station control module code plug.

4.28 DVP SEL (DIGITAL VOICE PROTECTION SELECT) 6, D1

The DVP SEL bit selects either the primary *DVP* code 1, or the secondary *DVP* subcode from the *DVP* control module.

4.29 DVP C/C (DIGITAL VOICE PROTECTION CODED/CLEAR) 6, D0

The DVP C/C bit, when active, enables the encryption and decryption functions of the *DVP* control module. Therefore, voice is transmitted "coded". When inactive, this bit disables the encryption and decryption functions. Therefore, voice is transmitted "clear".

4.30 ADDRESS 7, BITS 3 THRU 0 (RESERVED FOR FUTURE USE) 7, D3 THRU 7, D0

These parameter bits are reserved for future applications, or special customer needs.

4.31 TX RX C8, TX RX C4, TX RX C2, & TX RX C1 (TRANSMITTER/RECEIVER 1 CHANNEL) 8, D3 THRU 8, D0 and AUX C8, AUX C4, AUX C2, & AUX C1 (AUXILIARY CHANNEL) 9, D3 THRU 9, D0

These eight bits determine up to two sets of channels for the station. A channel is a station state which chooses predefined groups of station parameters such as transmit and receive frequencies and coded squelch code. The channel parameters are defined in the station control module code plug. Also, the station control module code plug contains the transmit, primary receive, and *Channel-Scan* parameters. The (second receiver control module) code plug contains the second receiver parameters. The TX/RX Channel occupies Address 8, Bits 3-0. The Auxiliary Channel (Second Receiver and Channel-Scan) occupies Address 9, Bits 3-0. Optionally, the bits making up the two channels can be re-grouped to form two different channels, in which one channel has more than four bits. In this optional configuration, the TX/RX Channel least significant bit (LSB) is at Address 8, Bit 0. If more than four bits are required to form the TX/RX channel representation, then those bits are taken from the auxiliary channel assignments beginning with bit 0 of address 9. The Auxiliary Channel then starts (LSB) with the next available bit after the last defined TX/RX channel bit and continues to bit 3 of address 9. If the two channels are to be independent, then they cannot share any bits. This means that the sum of the numbers of bits for the two independent channels must be eight or less.

4.32 ADDRESSES 10 and 11, BITS 3 THRU 0 (RESERVED FOR FUTURE USE) 10, D3 THRU 10, D0 and 11, D3 THRU 11, D0

These parameter bits are reserved for future applications or special customer needs.

4.33 REVERSE "WILD CARD" PARAMETER BITS

Use of the reverse "wild card" bits (8 bits total, addresses 12 & 13) requires the "wild card" module which resides in the Control Option Tray. The "wild card" inputs (four per card) activate or deactivate the appropriate Reverse "wild card" MUXbus bit in response to a status signal external to the station. The eight reverse "wild card" MUXbus bits also have an additional definition. They are considered alarms which, when activated, translate to alarm tones and are sent to the remote control console via the outbound wireline. Optionally, the alarm tones may also be transmitted. The alarms are tone bursts (beeps). The four bits in Address 12 are normally defined as internal alarms and do not require the "wild card" equipment. Station conditions which the station control module mon-

itors cause the station control module to write to these bits which, in turn, send the alarm tones.

NOTE

If the four internal alarm bits of address 12 are activated by the DMP, or some other control module connected to the MUXbus, then the alarm beeps will be activated, but the actual internal alarm condition will not be simulated. For example, if the PA Fail alarm bit (RW2 PA) were to be activated, two alarm beeps would be sent, but the PA itself would not be forced to dekey.

The station control module code plug contains information which determines whether an internal alarm gets written to the MUXbus, and also if all of the reverse "wild card" MUXbus bits will be enabled to activate alarm tones. Thus, all 8 bits can be configured as external alarm inputs, if desired. The maximum number of internal alarms is four.

5. INTERNAL / EXTERNAL STATION ALARMS

5.1 INTERNAL STATION ALARMS

RW4 OVG (Reverse "Wild Card" Bit 4 — Battery Overvoltage) 12, D3

The RW4 OVG bit is the battery overvoltage internal station alarm parameter, and is activated by the station control module. RW4 OVG is active when the station battery charger power supply indicates that the external (customer supplied) station emergency batteries are providing too much voltage (e.g., are overcharged).

RW3 SYN (Reverse "Wild Card" Bit 3 — Synthesizer Unlock) 12, D2

The RW3 SYN bit is the transmit or primary receiver synthesizer unlocked internal station alarm parameter, and is activated by the station control module. RW3 SYN is active when either the transmit, primary receive, or both synthesizers are unlocked.

RW2 PA (Reverse "Wild Card" Bit 2 — PA Fail) 12, D1

The RW2 PA bit is the rf power amplifier fail internal station alarm parameter, and is activated by the station control module. RW2 PA is active when the rf power amplifier has failed. A successful keyup or a station control module reset is required to clear the alarm. The alarm may be active when the transmitter is de-keyed, due to a prior failure. PA Fail means that one or both of the station control module PA status lines (PA On or PA Full Power) are inactive 30–45 msec after the start of a keyup, or for 30–45 msec continuously during keyup, thereafter. RW2 PA is not activated by the station control module if the PA is not keyed at full power due to the station control module personality EPROM rf power cut option. If the station control module service jumper (JU801) is installed, the station control module will activate RW2 PA regardless of the PA status lines. This is a reminder that the rf power amplifier is operating in a non-standard manner.

RW1 BAT (Reverse "Wild Card" Bit 1 — Battery Revert) 12, D0

This bit is the battery revert internal station alarm parameter activated by the station control module. RW1 BAT is active when the station battery charger power supply indicates that the station has lost ac power and has switched to emergency battery backup. RW1 BAT becomes inactive as soon as proper ac power is restored to the station.

5.2 EXTERNAL STATION ALARMS

RWC 5, RWC 6, RWC 7, & RWC 8 (Reverse "Wild Card" Bits 5 thru 8) 13, D3 thru 13, D0

Reserved for those reverse "wild card" applications which provide an interface between external station inputs and the MUXbus. These parameters can also provide additional alarm input capability thru information contained in the station control module code plug, which allows these bits to be identified as alarm inputs.

5.3 FORWARD "WILD CARD" PARAMETER BITS

FWC 1, FWC 2, FWC 3 & FWC 4 (14, D3 THRU 14, D0) and FWC 5, FWC 6, FWC 7, & FWC 8 (15, D3 THRU D, D0)

Use of the Forward "Wild Card" bits (up to 8 bits on addresses 14 & 15) require the "wild card" module (four outputs per card) which resides in the Control Option Tray. Remote wireline control activates these bits. The "wild card" control module responds by activating a relay closure or an open collector output. These closures and/or outputs can then be used to control equipment external to the station.

parts list

TRN5174A Diagnostic Board — PL-8196-C

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed; uF ±5%; 50 V: unless otherwise stated
C1201	8-11017A02	.0015
C1202, 1203	8-11017A17	0.1
C1204	21-11022K50	220 pF
C1205	23-84665F17	1500 +100-10%; 16 V
C1206, 1207	23-84665F32	330 ±20%; 10 V
C1208	8-11017A17	0.1
C1209, 1210	23-11019A09	1.0 ±20%
C1211	8-11017A20	.0015
C1212 thru 1214	8-11017A17	0.1
C1215, 1216	21-11022K50	220 pF
C1217	8-11019A02	.0015
C1218		NOT USED
C1219	23-11019A40	47 ±20%; 25 V
C1220		NOT USED
C1221	23-83210A24	1000; 20 V
C1222	23-11019A40	47 ±20%; 20 V
C1223 thru 1228	21-11021G07	.01 +100-0%
C1229		NOT USED
C1230 thru 1235	21-11021G07	0.1 +100-0%
C1236	8-11051A16	0.33
C1237 thru 1239		NOT USED
C1240, 1241	21-11021G07	.01 +100-0%
C1242	21-11022K50	220 pF
C1243		NOT USED
C1244	21-11022K25	20 pF
C1245	8-11017A10	.018
C1246	21-11022K25	20 pF
C1247	21-11015B09	470 pF ±10%; 100 V
C1248, 1249		NOT USED
C1250	21-11021G07	.01 +100-0%
		diode: (see note)
CR1201, 1202	48-11034A01	silicon
CR1203	48-84616A09	hot carrier
CR1204	48-11034A01	silicon
		display:
DS1201 thru 1208	48-84329N01	LED ARRAY; 4-position (2 used)
DS1209, 1210	48-82771L03	7-segment display
		fuse:
F1201	65-82408R01	3A; 32 V
		connector, receptacle:
J1201	28-83835N01	male; 40-contact
J1202	9-831112N02	female; 8-contact
J1203	9-88254C03	female; single-contact; coded RED
J1204	9-88254C01	female; single-contact; coded BLK
J1205	28-83143M05	male; 4-contact
		coil, audio:
L1201	25-82786N01	choke, 600 uH
		transistor: (see note)
Q1210 thru 1204	48-869649	PNP; type M9649
Q1205 thru 1220	48-869706	NPN; Darlington; type M9706
Q1221	48-869653	FET, N-channel; type M9643
		resistor, fixed; ±5%; 1/4 W: unless otherwise stated
R1201 thru 1204	6-11009A89	47k
R1205	6-11009A62	3.6k
R1206 thru 1212	6-11009A89	47k
R1213 thru 1216		NOT USED
R1217, 1218	6-11009A89	47k
R1219 thru 1222	6-11009A56	2k
R1223 thru 1226	6-11009A23	82
R1227	6-11009A56	2k
R1228	6-11009B05	220k
R1229	6-11009B14	470k
R1230, 1231		NOT USED
R1232	6-11009A42	510
R1233	6-11009A84	30k
R1234	6-11009A62	3.6k
R1235	6-11009A97	100k
R1236	6-11009A56	2k
R1237	6-11009A34	240
R1238, 1239	6-11009A10	24
R1240	6-1100942	510
R1241, 1242	6-125B70	1; 1/2 W
R1243	6-10621C56	4.32k ±1%
R1244	6-10621C53	4.02k ±1%
R1245, 1246	6-11009B14	470k
R1247	6-11009B05	200k
R1248	6-11009B14	470k
R1249		NOT USED
R1250	6-11009A76	13k
R1251	6-11009A69	6.8k
R1252	6-11009A23	82
R1253 thru 1268	6-11009A76	13k
R1269 thru 1285		NOT USED
R1286 thru 1289	6-11009A89	47k
R1290, 1291	6-11009A76	13k
R1292		NOT USED
R1293	6-11009A84	30k
R1294	6-11009A49	1k
		switch:
S1201	40-84226N01	rotary: 16-position
S1202 thru 1205	40-83685N04	toggle; spdt
S1208	40-84449N01	rotary; 7-position; 2 pole
S1209	40-83685N06	toggle; dpdt
S1210	40-83685N04	toggle; spdt
S1211	40-83685N08	toggle; spdt
		integrated circuit: (see note)
U1201	51-82884L32	4-bit latch & 4-to-16 line decoder
U1202	51-82884L28	dual monostable multivibrator
U1203	51-82609M73	quad D-type flip-flop with clear
U1204, 1205	51-83548N18	BCD-to-HEX 7-segment latch-decoder-driver
U1206	51-82884L02	hex inverter buffer
U1207, 1208	51-82884L15	quad latch
U1209	51-82884L49	quad exclusive OR gate
U1210	51-82609M61	dual 5-input NOR gate
U1211	51-84371K83	quad 2-input NAND gate
U1213, 1214	51-83629M86	audio power amplifier
U1215	51-82609M05	operational amplifier
U1216	51-84320A47	5-volt regulator
U1217	51-83627M88	level shifter
U1218	51-84561L86	5-volt regulator
		mechanical parts
	36-83144N01	KNOB, control; 2 used
	9-82425R01	FUSE, holder

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

TKN8914A Diagnostic Cabling Kit — PL-8430-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		connector, plug:
P1203	28-84751N01	male; single contact (RED)
P1204	28-84751N02	male; single contact (BLK)
P1205	15-83142M08	housing; 4-contact
		mechanical parts
	1-80766D37	ASSEMBLY, connector and wire; includes P1205, and
	39-82717M01	CONTACT, receptacle; 4 used
	1-80766D47	ASSEMBLY, voltage probe (RED); includes P1203, and
	10-82465B02	WIRE, test probe (RED); 36" used
	29-82676C02	PROBE, test (RED)
	1-80766D48	ASSEMBLY, voltage probe (BLK) includes: P1204, and
	10-82465B01	WIRE, test probe (BLK); 36" used
	29-82676C01	PROBE, test (BLK)

THN6486A Housing and Hardware Kit — PL-8197-B

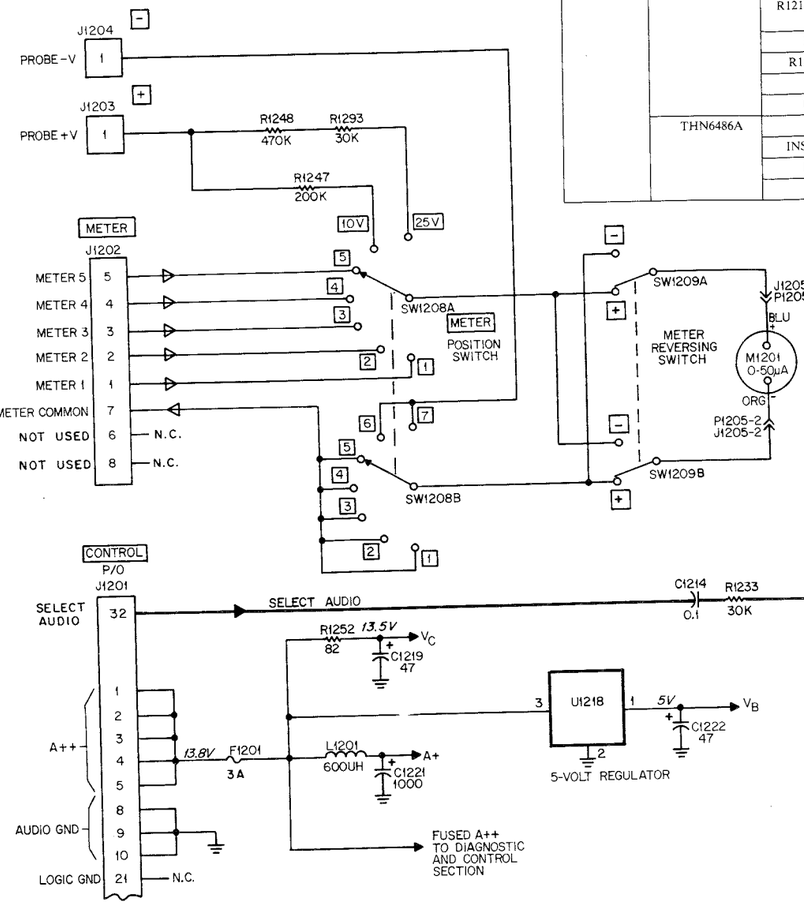
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		speaker:
LS1201	50-84450N01	4 ohm; 5 W; 3"
		meter:
M1201	72-83319G01	50 uA
		cable, assembly:
W1201	30-83941N02	40-conductor; includes: connectors
W1202	30-84225N02	8-conductor; includes: connectors
		mechanical parts
	2-10101A91	NUT, spring; 4 used
	3-10907A10	SCREW, machine; M2.5 × 0.45 × 6mm; 2 used
	3-83498N03	SCREW, tapping; M3.5 × 0.6 × 13mm; 4 used
	3-83498N12	SCREW, tapping; slotted star; 3 used
	3-83938N01	SCREW, self retaining; 10-32 × 1-1/8"; 2 used
	4-84180C01	WASHER, shoulder; 3 used
	7-83830N01	BRACKET, meter
	14-83022P01	INSULATOR, board
	14-84268A01	INSULATOR, transistor; 3 used
	15-83826N01	HOUSING, top
	15-83827N02	HOUSING, bottom
	42-10128A14	RING, screw retaining; rubber; 2 used
	42-10217A02	STRAP, tie; .091 × 3.62 (WHT); 2 used
	42-82143C09	CLIP, cable
	47-84568N01	ROD, mounting; right hand
	47-84568N02	ROD, mounting; left hand
	75-82230B14	PAD, rubber; 2 used
	75-84215A03	BUMPER, recessed; 4 used

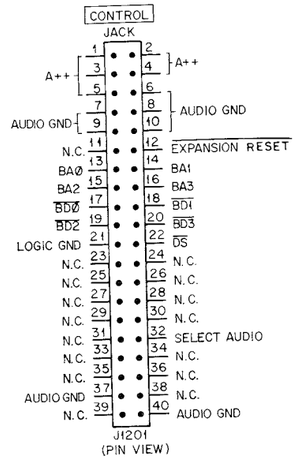
TLN2419 DIAGNOSTIC METERING PANEL
SCHEMATIC DIAGRAM AND PARTS LISTS

REVISIONS

PEPS-36253

ISSUE	KIT	REF. SYMBOL	CHANGE	LOCATION
A	TRN5174A	C1229	DELETED	SCHEMATIC, PARTS LIST & PCB
		C1233 thru 1236	WERE: 0.1 uF; 21-11021G04	
		CR1203	WAS: 48-11034A01	
		DS1209, 1210	WERE: 48-82771L01	
		R1219 thru 1222	WERE: 510 OHMS; 6-11009A42	
		R1227	WAS: 6.8k; 6-11009A69	
		R1243, 1244	WERE: 3.6k; 6-11009A62	
		R1294	ADDED	
		KNOB	36-83144N01; 2-ADDED	PARTS LIST
	THN6486A	F1201	ADDED	PARTS LIST
		INSULATOR	14-83022P01; ADDED	
		KNOB	2-DELETED	
		RING	WAS: 42-82234G01	



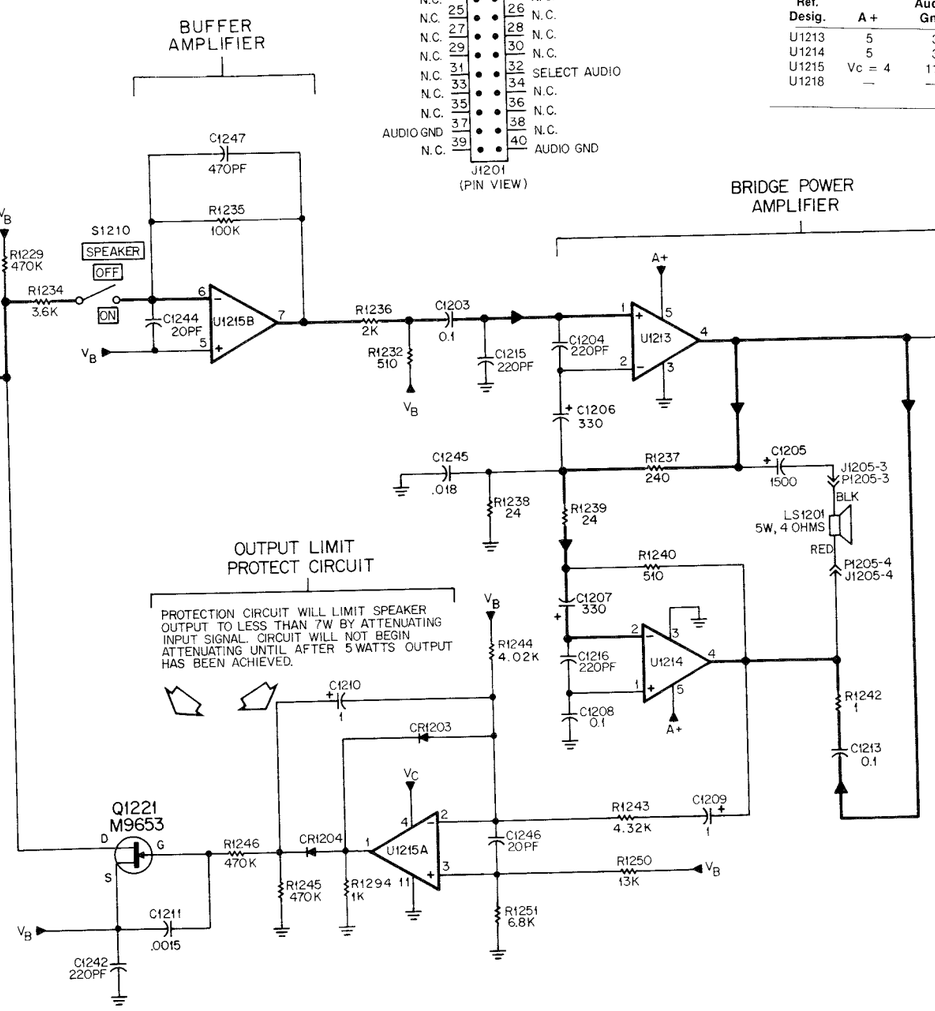


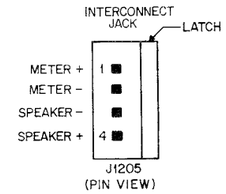
NOTE:

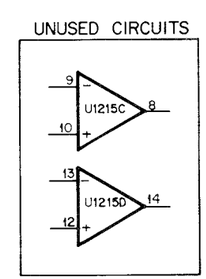
1. Unless otherwise specified, all resistor values are in ohms, and all capacitor values are in microfarads.

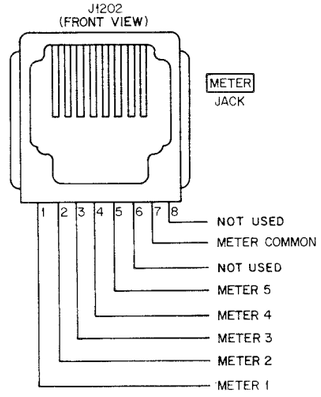
Integrated Circuit Data Chart

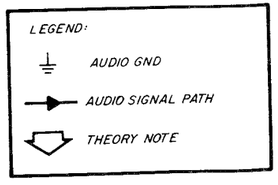
Ref. Desig.	A+	Audio Gnd	Description
U1213	5	3	Power Amplifier
U1214	5	3	Power Amplifier
U1215	Vc = 4	11	Quad Differential-Input Operational Amplifier
U1218	—	—	5-Volt Regulator: Pin 1 = 5 V; Pin 2 = Audio Gnd; Pin 3 = Fixed A +











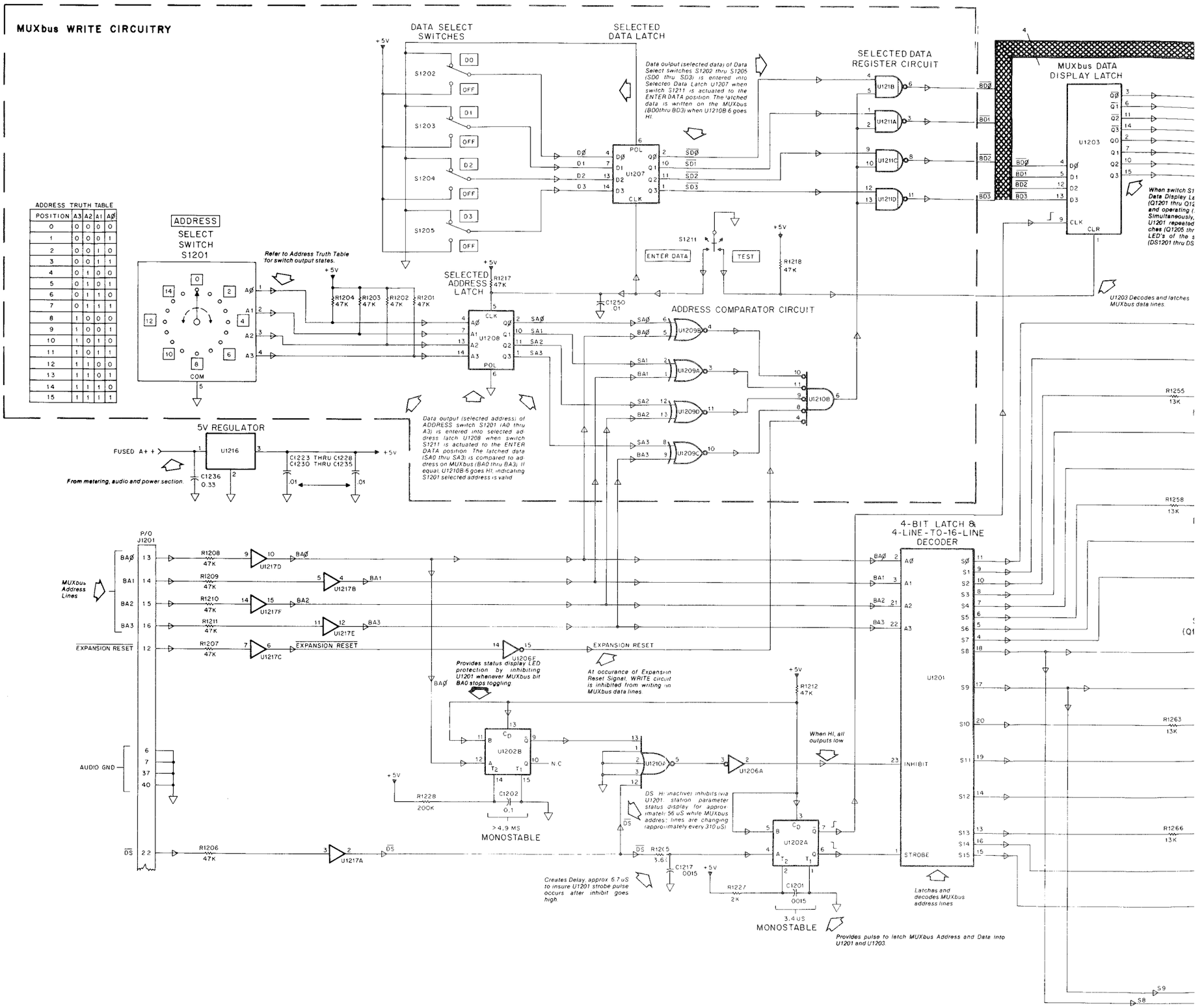
TLN2419A DIAGNOSTIC METERING PANEL
SCHEMATIC DIAGRAM

NOTES:

1. Unless otherwise specified, all resistor values are in ohms and all capacitor values are in microfarads.

Integrated Circuit Data Chart

Ref. Desig.	5 V	Logic Gnd	Description
U1201	24	12	4-Bit Latch & 4-Line-to-16-Line Decoder
U1202	16	8	Dual Monostable Multivibrator
U1203	16	8	Quad D-Type Flip-Flop With Clear
U1204, 5	16	8	BCD-to-Hex 7-Segment Latch-Decoder-Driver
U1206	16	8	Inverting Hex Buffer
U1207, 8	16	8	Quad Latch
U1209	14	7	Quad Exclusive-OR Gate
U1210	14	7	Dual 5-Input Positive-NOR Gates, With Totem-Pole Outputs
U1211	14	7	Quad 2-Input Positive-NAND Gates, With Open-Collector Outputs
U1216	—	—	5-Volt Regulator: Pin 1 = Fused A+; Pin 2 = Logic Gnd; Pin 3 = 5 V
U1217	1,13,16	8	TTL-or CMOS-to-CMOS Hex Level Shifter



MUXbus DATA LINES

SELECTED DATA REGISTER CIRCUIT

lected data of Data s S1202 thru S1205 3) is entered into Latch U1207 when is actuated to the osition. The latched n on the MUXbus when U1210B-6 goes

U1211B U1211A U1211C U1211D

TEST R1218 47K +5V

RESS COMPARATOR CIRCUIT

U1210B

MUXbus DATA DISPLAY LATCH

U1203

When switch S1211 is actuated to TEST position, MUXbus Data Display Latch U1203 forces all LED 5-volt switches (Q1201 thru Q1204) on, and causes the auxiliary (DS1210) and operating (DS1209) channel displays to indicate $F. Simultaneously, 4-bit latch & 4-Line-to-16-Line Decoder U1201 repeatedly ripples through the LED ground switches (Q1205 thru Q1220). These two actions cause all 64 LED's of the station parameter status display matrix (DS1201 thru DS1208) to light.

U1203 Decodes and latches MUXbus data lines.

4-BIT LATCH & 4-LINE-TO-16-LINE DECODER

U1201

Latches and decodes MUXbus address lines

When HI, all outputs low

U1206A

U1202A

R1212 47K +5V

R1227 2K C1201 .0015

3.4 US MONOSTABLE

Provides pulse to latch MUXbus Address and Data into U1201 and U1203.

LED 5-VOLT SWITCHES (Q1201 - Q1204)

Q1201 M9649 Q1202 M9649 Q1203 M9649 Q1204 M9649

R1219 2K R1220 2K R1221 2K R1222 2K

R1223 82 R1224 82 R1225 82 R1226 82

DS1201 DS1202 DS1203 DS1204

SP XMT	SCAN	T ALM DIS	S ALM DIS
RPT PTT	LIN PTT	LOC PTT	INTCOM
TX PL DS	TX ACT	RX2 ACT	RX1 ACT
RX PL DS	R1 PL DT	R1 SQ LV	R1 UN SQ
R2 MUTE	R2 PL DT	R2 SQ LV	R2 UN SQ
GD TN DT	AUX DET	RPT KD	RPT USQ
ACC DIS	EX DA DT	DVP SEL	DVP C/C

LED GROUND SWITCHES (Q1205 - Q1220)

Q1205 M9706 Q1206 M9706 Q1207 M9706 Q1208 M9706 Q1209 M9706 Q1210 M9706 Q1211 M9706 Q1212 M9706 Q1213 M9706 Q1214 M9706 Q1215 M9706 Q1216 M9706 Q1217 M9706 Q1218 M9706 Q1219 M9706 Q1220 M9706

R1253 13K R1254 13K R1255 13K R1256 13K R1257 13K R1258 13K R1259 13K R1260 13K R1261 13K R1262 13K R1263 13K R1264 13K R1265 13K R1266 13K R1267 13K R1268 13K

DS1205 DS1206 DS1207 DS1208

TX RX C8	TX RX C4	TX RX C2	TX RX C1
AUX C8	AUX C4	AUX C2	AUX C1
RW4 OVG	RW3 SYN	RW2 PA	RW1 BAT
RWC8	RWC7	RWC6	RWC5
FWC4	FWC3	FWC2	FWC1
FWC8	FWC7	FWC6	FWC5

STATION PARAMETER STATUS DISPLAY MATRIX

P/O U1201 — MUXbus Data Lines

R1289 47K R1288 47K R1287 47K R1286 47K +5V

BCD-TO-HEX 7-SEGMENT LATCH-DECODER-DRIVER

U1204 U1205

DS1210 AUXILIARY CHANNEL DISPLAY

DS1209 OPERATING CHANNEL DISPLAY

CHANNEL DISPLAY TIMING DIAGRAM

S8 OR S9 — $\overline{S8}$ OR $\overline{S9}$ — CLOCK PULSE — LOAD DATA — LATCH DATA

UNUSED CIRCUITS

U1206B U1206C

CR1201 R1290 13K CLOCK PULSE C1240 .01

Clock Pulse generating circuit used to latch auxiliary channel number data into U1204. See Channel Display Timing Diagram.

U1206E

CR1202 R1291 13K CLOCK PULSE C1241 .01

Clock Pulse generating circuit used to latch operating channel number data into U1205. See Channel Display Timing Diagram.

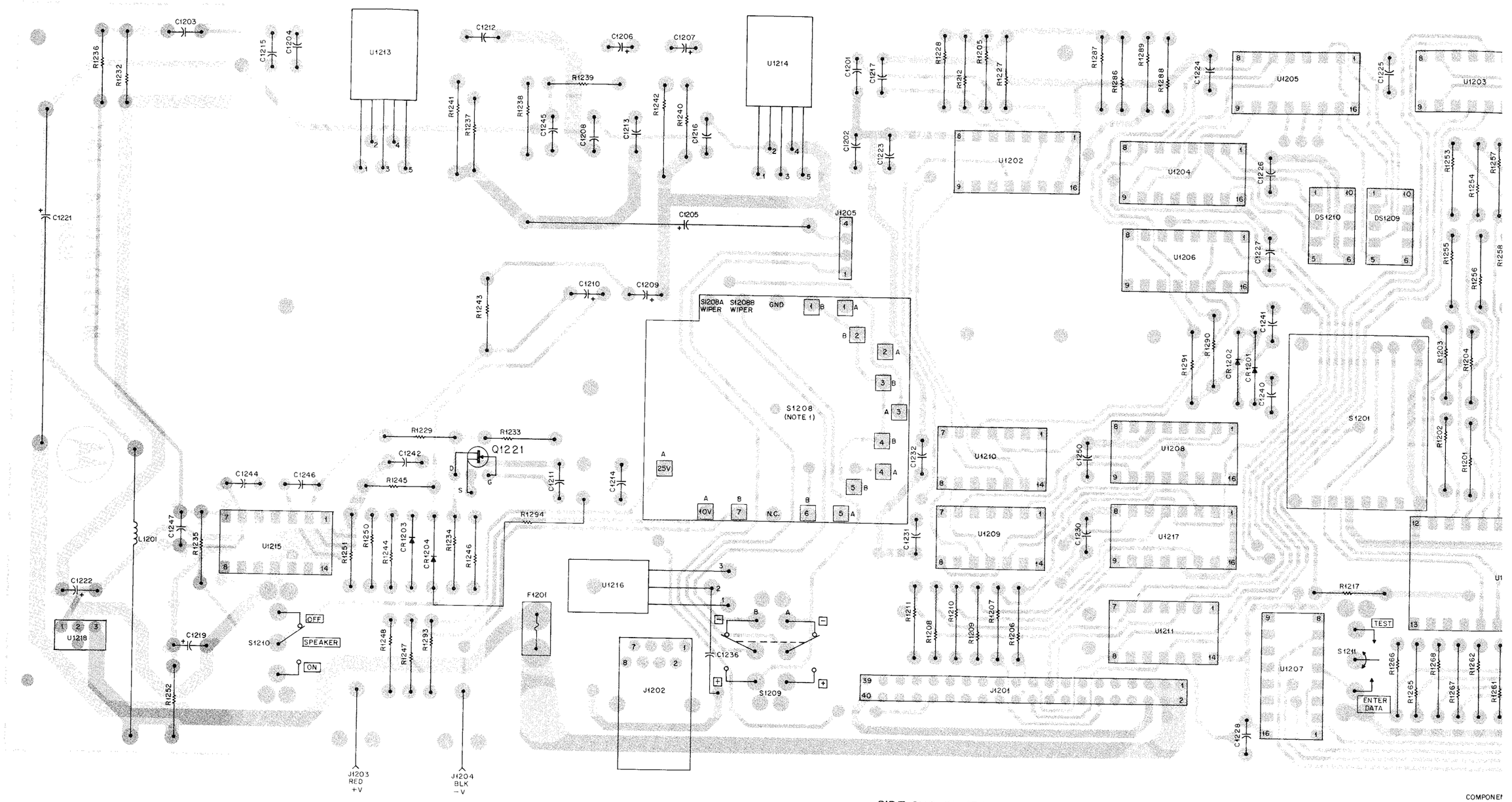
U1206D

LEGEND:
- THEORY NOTE
- LOGIC GND
- CONTROL SIGNAL

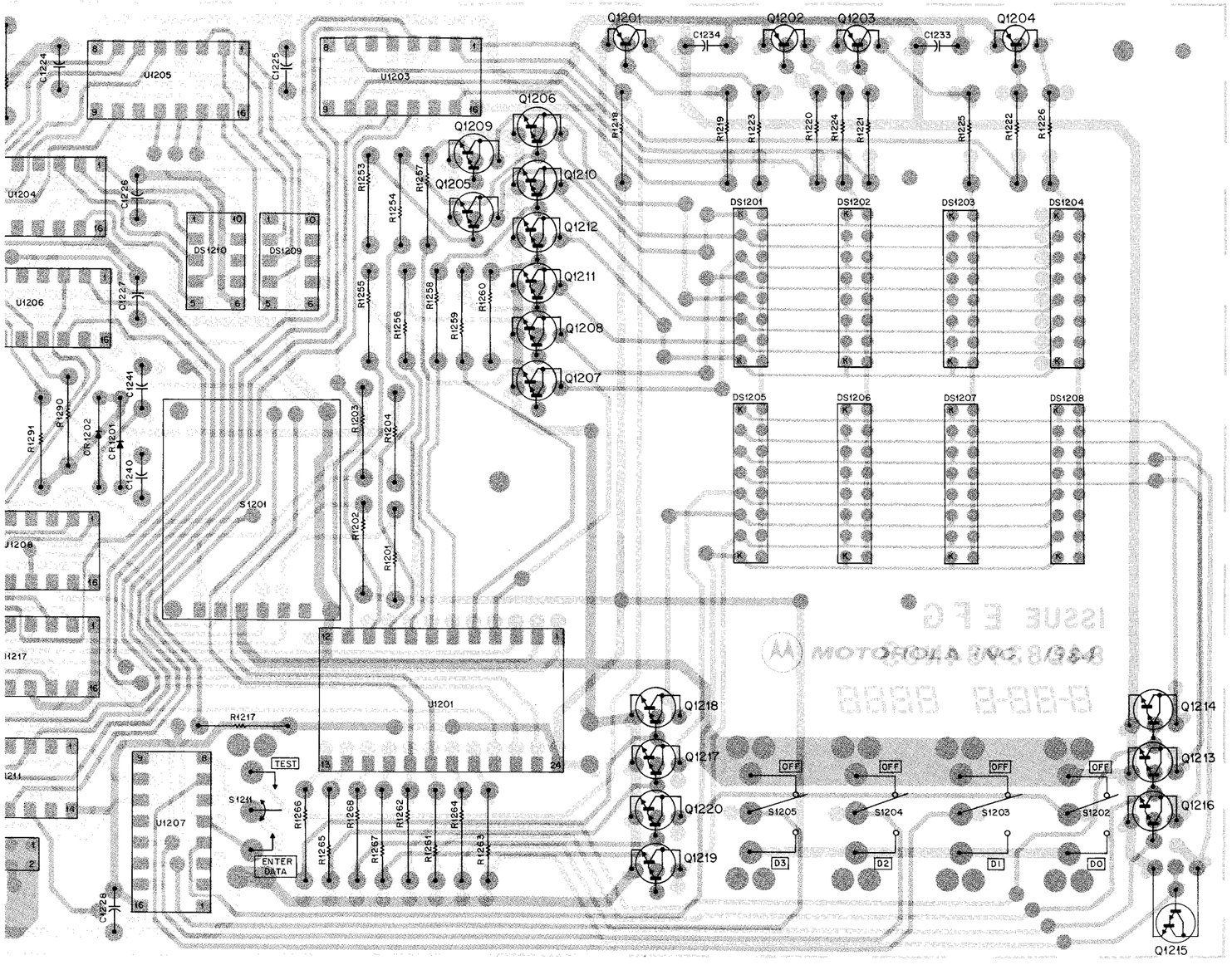
EEPS-35230-B

TLN2419A DIAGNOSTIC METERING PANEL

CIRCUIT BOARD DETAIL



SIDE SHOWN FROM COMPONENT SIDE



COMPONENT SIDE = BD-EEPS-36182-B
SOLDER SIDE = BD-EEPS-36183-B
OL-EEPS-36184-B

J1201

A++	1	2	A++
A++	3	4	A++
A++	5	6	AUDIO GND
AUDIO GND	7	8	AUDIO GND
AUDIO GND	9	10	AUDIO GND
NOT USED	11	12	$\overline{\text{EXPANSION RESET}}$
BA0	13	14	BA1
BA2	15	16	BA3
$\overline{\text{BD0}}$	17	18	$\overline{\text{BD1}}$
$\overline{\text{BD2}}$	19	20	$\overline{\text{BD3}}$
LOGIC GND	21	22	$\overline{\text{DS}}$
NOT USED	23	24	NOT USED
NOT USED	25	26	NOT USED
NOT USED	27	28	NOT USED
NOT USED	29	30	NOT USED
NOT USED	31	32	SELECT AUDIO
NOT USED	33	34	NOT USED
NOT USED	35	36	NOT USED
AUDIO GND	37	38	NOT USED
NOT USED	39	40	AUDIO GND

J1202

METER 1	1	2	METER 2
METER 3	3	4	METER 4
METER 5	5	6	NOT USED
METER COMMON	7	8	NOT USED

NOTES:
1. THE BOXED NUMBERS CORRESPOND TO THE SCHEMATIC DIAGRAM. "A" AND "B" CORRESPOND TO SWITCH SEGMENT S1208A AND S1208B, RESPECTIVELY.

J1205

1	METER +
2	METER −
3	SPKR −
4	SPKR +

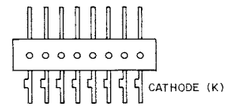
BASE DETAILS

TOP VIEWS

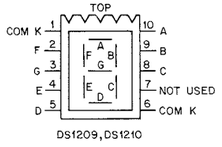
Q1201 THRU Q1220

Q1221

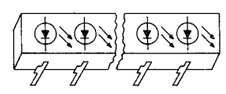
U1218

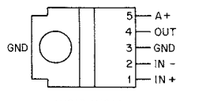


DS1201 THRU DS1208
(SEE DETAIL BELOW)

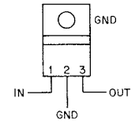


DS1209, DS1210





U1213, U1214



U1216